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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/765,671	01/26/2004	Jonathan A. Hack		9883

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EXAMINER

JACKSON JR, JEROME

ART UNIT PAPER NUMBER

2815

DATE MAILED: 05/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/765,671	Applicant(s) HACK, JONATHAN A.	
	Examiner Jerome Jackson Jr.	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6/4/04</u> . | 6) <input type="checkbox"/> Other: ____ |

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The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. There is no enablement for spintronic devices made with spark processed silicon material. Applicant's entire specification is a vague and indefinite list of bipolar, field effect, light emitting, and other electronic devices shown in the figures incorporating a magnetic material spark-processed amorphous silicon material which has not been proven in any literature to ever work as a spintronic bipolar, field effect transistor, etc. at any temperature. There is clearly no exact blueprint in this entire disclosure to enable anyone of any skill in any art to make and use a spintronic device from spark processed amorphous silicon material. The disclosure lacks exact materials, structures, processing temperatures, etc. to make and build these purported devices. For example, at ordinary processing temperatures for semiconducting devices (400+ degrees) apparently the magnetic silicon material loses its magnetic behavior. Likewise at high magnetic fields the material loses its magnetization. There is not even a discussion of these problems, much less any apparent solution. The test of non-enablement is whether undue experimentation is required to build the claimed devices. Clearly there is undue experimentation necessary to enable applicant's claimed devices. Vague statements

that the amorphous silicon magnetic material is produced by a spark process and therefore magnetic semiconductor devices are enabled is insufficient because there is a clear question of enablement in moving from an ephemeral material as the spark silicon to a high temperature processed material as a spintronic bipolar or field effect transistor which must have dopants activated by high temperatures. Applicant should submit experimental evidence of working devices to prove enablement. The claims all recite dopants and unless applicant proves that the devices are enabled the rejection will be maintained. Dopants require high temperature processing for activation and the high temperature should destroy the magnetic behavior.

Secondly, applicant discloses "nanoparticle" material and there likewise is no enablement that such material forms magnetic devices as claimed. There is again no exact material, structure, processing parameters as temperatures, starting materials, reagents, etc. which would enable one to make the claimed device without undue experimentation. Furthermore there is no indication at all that these nanoparticle spintronic devices have ever been built or could ever be built and clearly no blueprint in this specification to determine what concentration of nanoparticles or processing parameters are necessary for enabled devices. No one of ordinary skill could fabricate nanoparticle amorphous silicon spintronic devices from the vague, indefinite and vacuous directions as to add nanoparticles to the magnetic amorphous silicon material. Statements that nanoparticles such as carbon nanotubes or metal particles may be added as dopants to form the devices is not a sufficient blueprint for fabricating the claimed amorphous magnetic semiconductor devices without undue experimentation.

Thirdly, applicant broadens the description of spark-processed silicon to include "metals" (claims 14 and 15) or III-V or II-VI materials (claims 12 and 13). Metals such as iron or cobalt can be magnetic but applicant is not deserving of a patent for an iron magnet. I believe we could look on a refrigerator for anticipating art. The flexible refrigerator magnet apparently includes amorphous material and a "dopant" of "nanoparticle" elements such as transition elements or other "nanoparticles". Furthermore, how does applicant intend to fabricate spin transistors from these non-enabled "metal" materials ? There is no blueprint in this specification for metal based spintronic transistors. The specification discusses spark processing for silicon but not for metal magnetic material. Furthermore, ordinary transistors require semiconductor material and applicant apparently refers to semiconductor based transistors in the figures. Metals are not semiconductors.

In regard to III-V and II-VI materials exhibiting magnetic behavior similar to spark processed silicon, applicant should submit experimental evidence that such material can be magnetic under the same process conditions as for silicon as they are not group IV based materials. Furthermore these materials are not typically amorphous semiconductors and their processing requirements are much different due to different properties such as vapor pressure of the base material constituents.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

First, the claims do not recite any enabled devices as stated above and therefor are vague and indefinite. Secondly, no actual devices such as transistors or light emitting devices as described in the specification are recited in the claims. Therefor it is unclear exactly what device the claims attempt to claim. Thirdly, claims such as 11 do not follow as there is no recitation of nanoparticles in claims 1,2 or 10.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4,7-11,16,18-21 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Hack et al '97.

Applicant's submitted prior art teaches magnetic amorphous silicon material annealed in nitrogen. The material therefore anticipates claim 1 considering nitrogen as the "dopant". Annealing in oxygen apparently enables a photoluminescent device. Claim 1 is again anticipated. Claims 2-4 are rejected as the oxygen or nitrogen can be

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considered "nanoparticles" or n type dopants. Note also that the spark processed wafers in Hack were p-doped silicon wafers. Accordingly claims 1-4,7-11,16,18-21, and 24 are rejected as Hack's amorphous material also has such defect density as it is "amorphous" material spark processed and has p-type dopant.

Claims 1-11,14,15,18-24 as best understood, are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Nishimura '632.

Nishimura teaches an amorphous metal based magnetic material. Applicant's broad claims do not structurally distinguish over '632 with CoFeB material and B as the "dopant", or nanoparticle or CoFePt with Pt as the transition metal.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-6,12-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Prinz '177.

As best understood, applicant's claims do not structurally distinguish over the dilute magnetic II-VI based semiconductor of Prinz with Mn as the dopant, transition element, or nanoparticle.

Claims 1-24 rejected under 35 U.S.C. 103(a) as being unpatentable over Hack et al '97 or '746 in view of Kirczenow '953, Lee et al, and Johnson '695.

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The state of the art spin transistors are described by Kirczenow, Lee and Johnson. To form spin transistors it is necessary to inject spin polarized electrons into a material such as a semiconductor. See '953 where CoS₂ is suggested for spin electron injection into silicon semiconductor because they have similar lattice match (Table III and column 14). To one of ordinary skill it would be suggested to look for spin injectors which lattice match to semiconductor material from the teachings of Kirczenow. Accordingly it would have been obvious to have practiced a silicon based spin injector as Hack '97 or '746 with a silicon semiconductor as their lattices match closely. Claims 1-24 as best understood and as far as can be considered definite or enabled are obvious over the suggestions of the prior art on spin transistors practiced with silicon material.

Claims 1-24, as best understood, are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Hack '746.

Hack discloses amorphous silicon magnetic layers with n or p type doping (column 3 lines 54-56), and discloses III-V, metals, and other materials as magnetic amorphous semiconductors (column 3 lines 4-15). II-VI materials are obvious "other" semiconductor materials. The present claims are broad and do not structurally distinguish over the disclosure of '746.

Efros '772 is relevant art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jerome Jackson Jr. whose telephone number is 571 272 1730. The examiner can normally be reached on t-th 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 571 272 1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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JEROME JACKSON
PRIMARY EXAMINER